Compact, inexpensive and widely-tuneable liquid crystal lasers

Compact, inexpensive and widely-tuneable liquid crystal lasers

P.J.W. Hands, D.J. Gardiner, S.M. Morris, M.M. Qasim, T.D. Wilkinson, H.J. Coles
University of Cambridge, Engineering Dept, 9 JJ Thomson Ave, Cambridge, CB3 0FA, UK
Presenting author: pjwh4@cam.ac.uk

Recent research has shown dramatic improvements in the performance of band-edge lasers made from dye-doped chiral nematic liquid crystals (LCs) [1]. Continuously-tuneable laser emission is possible across the entire visible spectrum [2] and the near-infrared [3], from 450 to 850 nm, with efficiencies of more than 60%. Their compact and simple construction mean that low-cost, portable, tuneable lasers are now achievable. This technology enables the miniaturisation, cost-reduction and functional enhancement of many laser-based techniques, particularly for biomedical applications including fluorescence microscopy (e.g. Raman, flow cytometry, confocal, etc.). Advances towards laser-diode pumping and printable LC lasers offer us further size and cost reductions, and may ultimately enable the development of hand-held optical tools, for point-of-care medical diagnosis. We thank the EPSRC for funding of the COSMOS Technology Translation award (EP/H046658/1).

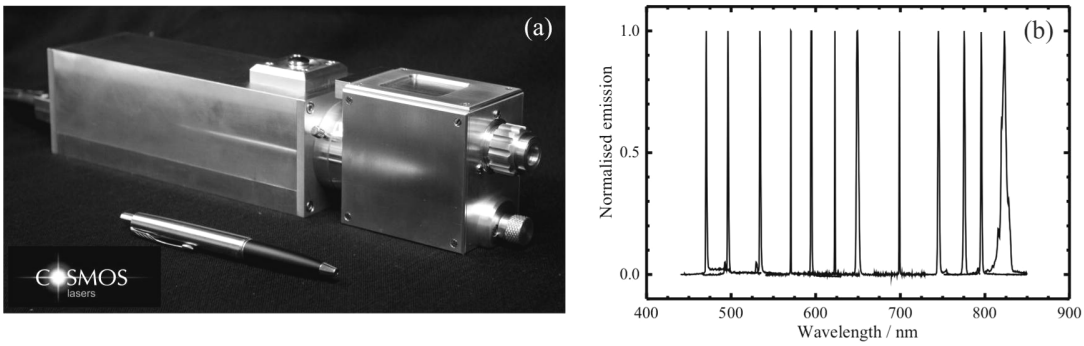

Figure 1: (a) The COSMOS liquid crystal laser portable demonstrator, and (b) example spectra from its broad and continuous and wavelength tuning range.

References

1. H.J. Coles et al, Nat. Photon. (2010) 4, 676
2. S.M. Morris et al, Opt. Express (2008) 16, 18827
3. P.J.W. Hands et al, Proc. SPIE (2011), 8114-28